(19) Japanese Patent Office (JP) (11) Japanese Patent Application Kokai Publication No.
(12) Official Gazette for Kokai Patent Applications (A) Kokai No.:1983-35028

(51) Int.Cl.³	Identification Symbol	JPO File Number	(43) Kokai Publication Date: March 1, 1983
B 21 D 51/30		7225-4E	

Number of Claims: 2
Request for Examination: Not Submitted
(Total of 6 pages in the original Japanese)

(54) A method for forming a double winding mechanism and tools thereof

(21) Application Filing No.: 1981-131491
(22) Application Filing Date: August 24, 1981

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Specifications

1. Title of the Invention

A method for forming a double winding mechanism and tools thereof

2. Claims

(1) A method for forming a double winding mechanism, structured by an opening edge component and edge component of a can body, in which a circular concave component is formed close to and below the corresponding opening edge component, and faces the lower edge of the cover hook of the double winding mechanism to be formed; the corresponding edge component, onto which a bottom perimeter component possessing a shape which corresponds to the upper surface of the corresponding circular concave component has been formed, is inserted into the corresponding opening edge component.

The upper surface of the circular concave component and the corresponding bottom perimeter component are then joined together, and double winding is conducted, while the corresponding circular concave component and corresponding bottom perimeter component are supported in a sandwich-like manner by means of a support roll, which is joined together with the corresponding circular concave component, as well as by means of a chuck, which is joined together with the corresponding bottom perimeter component.

(2) Tools for forming a double winding mechanism, structured by an opening edge component and edge component of a can body; said tools comprising a support roll, which can be joined together with the circular concave component formed close to and below the corresponding opening edge component facing the lower edge of the cover hook of the double winding mechanism to be formed, and a chuck, which can be joined together with the bottom perimeter component of the corresponding edge component, and which possesses a shape which corresponds to the upper surface of the corresponding circular concave component.

3. Detailed Explanation of the Invention

The present invention relates to a method for forming a double winding mechanism and tools thereof; in more detail, it relates to a method for forming a double winding mechanism and tools which are utilized in the process of forming the mechanism, in which almost no axial load is applied to the can body.

The traditional double winding mechanism has been structured in the following manner, as shown in Figure 1 (a): Onto Flange Component 2, which is formed on Can Body 1, Curl Component 4, which is formed on Edge Component 3 (the lid or bottom), is placed, and Chuck 6 is inserted into Lid Component 3 *[the Lid Component and Edge Component are the same component; therefore, the same reference numeral is used for these]*, which is equipped with concave Panel Component 5. Subsequently, while the lower portion of Can Body 1 is being supported by a lifter (not shown in the figure), Curl Component 4 and Flange Component 2 are pressed between First Winding Roll 7 and Chuck 6, as shown in Figure 1 (b), and Edge Component 4a of the Curl Component consequently faces upwards, while Flange Component 2 faces downwards; thus, Preliminary Winding Component 8 is formed deeply within Flange Component 2.

Thereafter, Component 4a'(commonly referred to as the Cover Hook), which corresponds to Curl Component 4a, is formed, and Component 2' (commonly referred to as Body Hook), which corresponds to Flange Component 2, is formed, both by Second Winding Roll 9, to form Double Winding mechanism 10, in which these components maintain close contact with each other by means of a sealing compound layer (not shown in the figure). In addition, within Double Winding Mechanism 10, Raise 11, which rises higher from the perimeter of Panel Component 5 on Edge Component 3, is commonly referred to as the Chuck Wall. As stated above, in the traditional double winding mechanism, particularly in the process for forming Preliminary Winding Component 8, a considerably heavy axial load (for example, 150kg) is applied to Can Body 1 in order to support the component force in the axial direction applied to Flange Component 2, to prevent the relief of Flange Component 2, and to secure the predetermined length of Body Hook 2' to be secured. Therefore, when attempts have been made to apply the traditional double winding mechanism to can bodies composed of materials with low levels of axial load resistance, the can body has become buckled, and satisfactory products have been unobtainable. Due to these reasons stated above, the thickness of such can body could not be thinner than a predetermined thickness (for example, in the case of steel materials such as tin-coated steel planks, approximately 0.10mm; in the case of aluminum alloys, approximately 0.13mm), due to the restrictions derived from application of the axial load in the process of double winding (even with thinner degrees of thickness than the above-stated predetermined thickness, in the case of cans in which the inner pressure is higher than the atmospheric pressure, for example, deformation or other troubles relative to deformation derived from external impact do not occur). Therefore, it has been difficult to decrease cost by decreasing the thickness of the can body. In addition, due to the same reasons, it has also been difficult to apply the traditional double winding mechanism to can bodies formed with relatively inexpensive materials, such as plastic, paper, or layered products of these (including layered products with metal coatings). Due to the reasons stated above, the traditional double winding mechanism has been problematic in that it cannot be applied to such types of can bodies as stated above, in spite of the fact that it has been highly reliable in terms of air tightness.

The present invention aims to these problems as stated above, which have been observed with the traditional technology.

In order to achieve the goal stated above, the present invention provides a method for forming a double winding mechanism, structured by an opening edge component and edge component of a can body, in which a circular concave component is formed close to and below the corresponding opening edge component, and faces the lower edge of the cover hook of the double winding mechanism to be formed; the corresponding edge component, onto which a bottom perimeter component possessing a shape which corresponds to the upper surface of the corresponding circular concave component has been formed, is inserted into the corresponding opening edge component. The upper surface of the circular concave component and the corresponding bottom perimeter component are then joined together, and double winding is conducted, while the corresponding circular concave component and corresponding bottom perimeter component are supported in a sandwich-like manner by means of a support roll, which is joined together with the corresponding circular concave component, as well as by means of a chuck, which is joined together with the corresponding bottom perimeter component.

In addition, the present invention provides tools for forming a double winding mechanism, structured by an opening edge component and edge component of a can body; said tools comprising a support roll, which can be joined together with the circular concave component formed close to and below the corresponding opening edge component facing the lower edge of the cover hook of the double winding mechanism to be formed, and a chuck, which can be joined together with the bottom perimeter component of the corresponding edge component, and which possesses a shape which corresponds to the upper surface of the corresponding circular concave component.

The following is an explanation of the present invention utilizing figures showing working examples.

Reference Numeral 21 shows an example of a can body to which the present invention has been applied; it is formed by means of drawing ironing treatment applied to metal planks such as tin-coated steel planks or aluminum alloy planks. On the edge perimeter of Opening Edge Component 22 of Can Body 21, Flange Component 23 is formed. In cases in which the Main Body Portion 24 of Can Body 21 is relatively thin (for example, in cases in which the said portion is formed with tin-coated steel planks, and is less than approximately 0.10mm, or in cases in which it is formed with aluminum alloys, and is less than approximately 0.13mm), and its resistance to the axial load is small, it is desirable to utilize a flange formation method in which the axial load applied to the can body is relatively small, such as the spinning method

(for example, the method disclosed in the Official Gazette of Utility Model Kokoku No.: 1971-19409). Reference Numeral 25 represents a circular concave component possessing a circular-arch-shaped cross-sectional surface which extends in the circumferential direction, and is formed by means of well-known methods such as the spinning method or purge method, utilizing a splitting mold. Circular Concave Component 25 is formed in a manner so that its Upper Edge 25a is located at a position close to (the distance between Component 22a and Upper Edge 25a is slightly larger than the thickness of Lower Protrusion 31b of First Winding Roll 31 and Lower Protrusion 33b of Second Winding Roll 33, and is favorably within the range from approximately 0.1mm to 1.0mm) and below Opening Edge Component 22a (see Figure 8) facing Lower Edge 38a of Cover Hook 38 of Double Winding Mechanism 37 to be formed.

The Edge Component 26 (Lid Component) shown in Figure 3 functions to seal Can Body 21 shown in Figure 2; Reference Numeral 27 represents the Curl Component (its inner surface is coated with a sealing compound, which is not shown in the figures), 28 Wall, and 29 Bottom. Perimeter 29a of Bottom 29 possesses a shape which corresponds to Upper Edge Component 25b of Circular Concave Component 25 (the inner surface between Inner-Most Portion 25c and Upper Edge Component 25a). Namely, Perimeter 29a of Bottom 29 possesses circular-arched shape, the cross-sectional surface of which concaves inwardly. Figure 4 shows the status in which Edge Component 26 is inserted into Can Body 21. Under this status, the height of Wall 28 is determined in a manner so that Upper Surface 25b of Circular Concave Component 25 and Bottom Perimeter 29a of Edge Component 26 are nearly in complete contact, and the point of Flange Component 23 and the inner surface of Curl Component 27 are nearly in contact.

In the present invention, in order to prevent the axial load from being applied to Main Body Portion 24 at the time of double winding, in particular, at the time of forming the preliminary winding component, double winding is conducted, while Circular Concave Component 25 and Bottom Perimeter Component 29a are supported in a sandwich-like manner by the support roll, which is joined together with Circular Concave Component 25 of Can Body 21, and by the chuck, which is joined together with Bottom Perimeter Component 29a of Edge Component 26.

In Figure 5, which is a schematic diagram of the tools utilized for the double winding mechanism in the present invention, Reference Numeral 30 represents the First Support Roll, 31 the First Winding Roll, 32 the Second Support Roll, 33 the Second Winding Roll, 34 the Chuck, and 35 the Lifter. As shown in Figure 6, Chuck 34 is equipped with Joint Component 34b formed on the lower portion of Perimeter Component 34a (its external diameter is nearly equal to the inner diameter of Wall 28 of the edge component) possessing a shape corresponding to that of Bottom Perimeter Component 29a of the edge component, and is rotated by means of a driving mechanism (not shown in the figures) through Axis 34c; however, no shift in the vertical direction is conducted. First Support Roll 30 and Second Support Roll 32 respectively possess Circumferential Surfaces 30a and 32a equipped with a protruding profile corresponding to Circular Concave Component 25, and are structured with a mechanism (for example, a cam mechanism or a link mechanism; not shown in the figures) close to and detachable from Chuck 34 along the same level. In addition, under conditions in which the rolls are close to Chuck 34, as shown in Figures 6 and 8, the First and Second Support Rolls are provided so as to sandwich the portion corresponding to Upper Surface *[formerly referred to as Upper Edge Component]* 25b between Joint Component 34b of the chuck and Circumferential Surfaces 30a and 32a, and Bottom Perimeter 29a.

First Support Roll Axis 30b and Second Support Roll Axis 32b are pivoted by means of a bearing (not shown in the figures) in a freely rotatable manner. First Winding Roll 31 and Second Winding Roll 33 are structured nearly in the same manner as the traditional winding rolls, and are respectively equipped with Winding Concaves 31a and 33a. In addition, these First and Second Winding Rolls are provided in a manner so that, at the time of winding, the axes of Chuck 34, First Support Roll 30, and First Winding Roll 31 are all located on the same plane, and the axes of Chuck 34, Second Support Roll 32, and Second Winding Roll 33 are all located on the same plane. Lifter 35 is pivoted by the same bearing (not shown in the figures) as Chuck 34 is pivoted by in a freely rotatable manner, and is structured by means of a driving mechanism (not shown in the figures) in a vertically shiftable manner.

Through the utilization of these tools stated above, double winding is conducted according to the following manner. First of all, Edge Component 26 is inserted into Can Body 21 as shown in Figure 4; subsequently, Can Body 21 is placed on Lifter 35, and the lifter is elevated. Consequently, Joint Component 34b is joined with Bottom Perimeter 29a. At this time, First Support Roll 30, Second Support Roll 32, First Winding Roll 31, and Second Winding Roll 33 are located at a position detached from Chuck 34; subsequently, First Support Roll 30 and Second Support Roll 32 (or First Support Roll 30 only) are placed closer to Chuck 34 so that their Circumferential Surfaces 30a and 32a (or Circumferential Surface 30a only) become joined with Circular Concave Component 25. Figure 6 indicates this status. Subsequently, Chuck 34 is rotated (Chuck 34 may be rotated prior to this point), First Winding Roll 31 is placed closer to Curl Component 27, and Curl Component 27 along with Flange Component 23 are pressed between these and Chuck 34, as shown in Figure 7; consequently, the preliminary winding mechanism is formed. Moreover, Winding Component 36 shown in Figure 7 indicates the status immediately prior to the completion of forming the preliminary winding mechanism. At this time, as Flange 23 tries to become released, force in the axial direction is applied to Opening Edge Component 22.

However, because Circular Concave Component 25 and Bottom Perimeter 29a are sandwiched and pressed by First Support Roll 30 and Chuck 34, the above-stated force is not applied to Main Body Portion 24. Subsequently, First Winding Roll 31 is detached, Second Winding Roll 33 is made closer, and Second Support Roll 32 is joined together with Circular Concave Component 25; under this status, Double Winding Mechanism 37 is formed as shown in Figure 8.

The present invention is not limited to the working examples stated above. Can Body 21 may consist of a can body which is equipped with two opening edge components onto which side joints are formed by either welding, soldering, or adhering (including thermal fusing), and the edge facing the layered plank may be fabricated with metal planks, plastic sheets, paper materials (including paper materials impregnated or coated with wax, plastic, etc.), or appropriate combinations of plastic sheeting/films, paper materials, or metal foils. Amongst these, the present invention can be particularly favorably applied to can bodies fabricated with materials possessing low levels of axial load resistance, and which are reduced in terms of thickness and rigidity. In addition, the material utilized for Edge Component 26 may be selected from among metal planks (including metal planks onto the surface of which a coating film or printing film has been formed), layered materials formed from metal plated planks (in order to secure winding strength, it is desirable for such to be greater than approximately 20μm in the case of foils with steel or iron base materials, and more than approximately 50μm with aluminum foil) and plastic films/sheets, according to usage.

According to the present invention, because double winding is conducted while the circular concave component of the can body and the bottom perimeter of the edge component are sandwiched and pressed by the support roll and the chuck, an axial load is almost not at all applied to the Main Body Portion during double winding. Therefore, it has become possible to conduct double winding with can bodies which are reduced in terms of thickness and rigidity, with which it was formerly impossible to conduct double winding. This has created effects relative to reducing cost and widening the choices for materials.

4. Brief Explanation of the Drawings

Figure 1 is a longitudinal sectional view of the essential portion for explaining the traditional double winding mechanism. Figure 1 (a) is a diagram showing the status prior to double winding. Figure 1 (b) is a diagram showing the status in which the preliminary winding component has been formed. Figure 1 (c) is a diagram showing the status in which the double winding mechanism has been formed; Figure 2 is a longitudinal sectional view of an example of the can body to which the present invention has been applied.

Figure 3 is a longitudinal sectional view of an example of the edge component to which the present invention has been applied. Figure 4 is a longitudinal sectional view showing the status in which the edge component shown in Figure 3 has been inserted into the can body shown in Figure 2. Figure 5 is a plane view showing a working example of the tools of the present invention. Figure 6 is a longitudinal sectional view of the essential portion showing the status prior to the formation of the preliminary winding component utilizing the tools shown in Figure 5. Figure 7 is a longitudinal sectional view along the VI-Vi line shown in Figure 5; it shows the status in which the preliminary winding component is nearly formed. Figure 8 is a longitudinal sectional view showing the status in which the double winding mechanism is formed utilizing the tools shown in Figure 5.

21: Can Body
22: Opening Edge Component
25: Circular Concave Component
25b: Upper Surface *[also referred to as Upper Edge Component]*
26: Edge Component *[also referred to as Lid Component]*
29: Bottom Perimeter *[Strictly speaking, Bottom 29 and Bottom Perimeter 29a]*
30: First Support Roll
32: Second Support Roll
34: Chuck
37: Double Winding Mechanism
38: Cover Hook
38a: Lower Edge

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Figure 1
[see the original for Figure 1]